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AUTHOR Tedeschi, Philip J.
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ABSTRACT

Thirty informants were presented with sets of clauses punctuated as in the pattern "S1. If S2. S3" and asked which clause, S1 or S3, the "if" clause modified. Independently, several linguists judged the sentences "S1, if S2" and "S2, if S3" acceptable. Missing intonational clues or improper punctuation, which frequently occurs in advertising, could force a processing grammar to disambiguate the qualification in the above. Semantic data alone prove insufficient for this disambiguation process; anaphoric and temporal relationships will serve to disambiguate in such cases, but are not always present. If Strawson's "Indirectness Condition" is elaborated by examining the types of non-truth-functional relationships leading from the antecedent to the consequent, a hierarchy which predicts the informants' selections is established. This pragmatic hierarchy, causal/pseudo-causal/inductive/inductive and deductive/deductive, would aid the processing of potentially ambiguous clasuses. It is claimed that the same hierarchy could be applied to disambiguate sentences of the forms "S1. If S2. S3." Further, it is claimed that this hierarchy applies within a generative grammar to limit the acceptability of conjoining arbitrary sentences with "if."
(Author/TL)

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On Processing Conditional Sentences

Philip J. Tedeschi, University of Michigan

A generative grammar must extensively interact with a pragmatic and semantic component. For the past several years interpretive semanticists, generative semanticists, sociolinguists, and language philosophers have belabored this point. The three linguistic paradigms differ in the type of contextual information they consider as most basic and in the point of application of semantic and pragmatic information in the syntactic process but they do agree that semantic and contextual information does limit the acceptability of sentences.

There has been a surge of interest in processing grammars and processing strategies recently. For example, consider the recent works of T. Bever, G. Lakoff, W. Woods, T. Winograd and almost all speech-understanding-systems researchers.[1] In this paper the interaction of semantic and pragmatic factors with an assumed syntactic processor[2] will be investigated. A particular situation will be investigated to see if semantic and pragmatic information will help disambiguate a potentially ambiguous set of clauses.

While transcribing academic lectures for data on conditional sentence usage, it was noted that there rarely was any difficulty deciding whether an *if* clause qualified the preceding or following sentence. At first, this was attributed to intonational clues marking clause boundaries rather than sentence boundaries. Even when intonational clues were not present, due to the lecturer's thought pauses, corrections, backtracking, whatever, there still was little difficulty identifying the qualified independent clause.

It has apparently become a habit of certain advertising firms to punctuate explicit subordinate clauses with full sentence punctuation. Examining various advertisements that were so punctuated, there was little if any difficulty whether the subordinate clause qualified the preceding or following sentence.

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In some advertisements the qualified clause could not be easily identified but in these cases the ambiguity would not detract from the basic message of the advertisement. Consider Sentence (1). The situation or frame here is potentially ambiguous. The usual interpretation is that the latter sentence is qualified by the *if* clause: note that, as could be expected in advertising, either interpretation gets the basic message across.[3]

(1) The third cigarette, a switch you'll have to try. If you've been experimenting with other brands. Chances are, you've been bounced back and forth between two kinds of cigarettes.

What kind of information does the addressee/reader use to disambiguate this situation? First, we can note that there are several processing strategies that may be involved in the disambiguation process. As T. Bever (1970) and D. Keller-Cohen (1974) have noted, complex sentences, in general, are easier to interpret or acquire if they are encoded in the order of temporal progression, i.e. sequentially. Sentence (2a) is encoded sequentially; Sentence (2b) is not.

(2) (a) If Ford doesn't change his mind, New York will be forced to default.
(b) New York will be forced to default, if Ford doesn't change his mind.

If we examine explicit indicative conditional sentences, the time reference of the antecedent clause usually precedes or is contiguous with the time reference of the consequent clause as in Sentences (2a and b). In the 145 explicit indicative conditional sentences occurring in three issues of a weekly news magazine[4], no sentences occurred with any other temporal relationship. In the experimental frame (3) we, thus, expect that the consequent clause will have a time reference following that of the *if* clause. If one of the complete sentences S_1 or S_3 has a time reference preceding the reference of the *if* clause, we expect that the *if* clause qualifies the other sentence. If the time reference is insufficient to disambiguate (3),

i.e. S_1 and S_3 both temporally occur after S_2, then on the basis of sequentiality we can predict that <u>if S_2</u> modifies S_3.

(3) S_1. If S_2. S_3.

Disregarding sentence-internal <u>if</u> clauses, the 145 conditional sentences in the news magazine occurred with an initial <u>if</u> clause twice as often as they occurred with a final <u>if</u> clause. Basing a processing strategy as above on this ratio, we would predict that <u>if S_2</u> modifies S_3. The prediction would correctly disambiguate (3) two-thirds of the time if the ratio from the magazines is close to actual usage.

As the results below will indicate addressees/readers can disambiguate occurrences of free-floating subordinate clauses in which the time reference of the clauses is insufficient to predict qualification much better than this ratio indicates. Also the results will show that there is no extreme tendency to select the latter sentence as the qualified clause.

Semantic information like time reference is playing a role in the disambiguation process but more than mere time reference is needed. As researchers involved in speech-understanding systems have discovered[5], to construct a successful speech processor it is not only necessary to have the phonetic, phonological and syntactic segments of the grammar interacting to form hypotheses about a speech stream, the semantic component must interact with the rest of the grammar.

One interesting question at this point is to ask what other kinds of semantic/pragmatic information would be useful. According to Strawson (1956) the primary use and meaning of conditional sentences is non-truth-functional; i.e., there are non-truth-functional grounds for accepting that S_1 is a "reason" for believing S_2 in order to felicitously utter <u>If S_1, S_2</u>. Grice disputes

Strawson's claim, the so-called "Indirectness Condition". He claims that the semantic analysis of indicative conditional sentences is the material implication operator of traditional logic. Given this semantic analysis, two usage conventions govern the occurrence of conditional sentences. The non-truth-functional "reason" of the "Indirectness Condition" is a conversational implicature derived in the following manner from Grice's maxim of quantity: Stating that two sentences stand in a particular truth-functional relationship (the material implication relationship) conveys only very minimal information to an addressee; Hence, when a speaker uses a conditional sentence, he conversationally implicates that there are other "reasons" for accepting that the antecedent stands in a relationship with the consequent. Grice's second convention deals with the non-usage of conditionals when the antecedent is known to be false and with addressees' lack of truth-functional intuition about conditional sentences that have a false antecedent. This convention will not be discussed.

In the potentially ambiguous frame described in (3) Grice's analysis of conditionals would predict that addressees/readers would one of the independent clauses over the other if it could stand in a non-truth-functional relationship with the if clause. In cases where both clauses could stand in a non-truth-functional relationship with the if clause Grice's analysis makes no predictions. Data relevant to this non-claim will be presented below.

Grice's main test for conversational implicature as opposed to semantic force is suspendability (cancellability in Grice 1972). He gives a number of examples in Lecture IV of conditional sentences in which the "Indirectness Condition" is suspended. With the exception of three types of sentences Grice's examples of suspension of the non-truth-functional meaning of conditionals involve "logic" games, i.e. rhetorical usages. Sentence (4) is an example:

(4) [In answer to 'Where is Smith?'] I know just where Smith is and what he is doing, but all I will tell you is that if he is in the library he is working.

A logical game of the type in (4) can almost always be invented to allow strictly truth-functional, rhetorical, usage of almost any indicative conditional.[6] Following Strawson, however, I believe this type of usage is not primary but is derivative. The language conditional entails the relevant material implication and in particular contexts the conditional reduces to have the force of material implication.

Grice gives three examples of contextual cancellability of Strawson's "Indirectness Condition". The two types of cancellability Grice uses to establish conversational implicature are first use in rhetoric as in (4) and contextual cancellability, i.e. cancellation in a particular linguistic environment.

(5) If England win the first test, they will win the series, you mark my words.
(6) Perhaps, if he comes, he will be in a good mood.
(7) See that if he comes, he gets his money.

Grice claims that Sentence (5) is uttered as a pure guess and as such is a statement about the truth value of the two statements. My intuition would claim that the "Indirectness Condition" is still in force. People do not make predictions, even predictions about sporting events, without some belief set involved. Usually when a speaker utters a sentence like (5) he has something like the following in mind:

(8) England is a relatively good team. Winning the first test will give them momentum. This momentum will be sufficient to cause them to win the series.

People really do not make too many context-less guesses. Note that Sentences (9) and (10) could also be used to convey a belief like (5). The difference in usage is governed by something like the speaker's expectation that the antecedent will result in the consequent. The stronger the

belief in the reasons that lead from the antecedent to the consequent the stronger the form that a speaker will use.[7]

(9) If England wins the first test, I believe they will win the series.
(10) If Michigan is leading at the half, they've won the game.

In sentences making predictions like (5), (9), and (10) the non-truth-functional reason that implies the consequent from the antecedent is not totally supplied by the antecedent. There is a reasoning process involved from the context of utterance. The context together with the antecedent does lead non-truth-functionally to the consequent. A common response to these utterances is the question 'Why do you believe that?'. In asking this question the addressee is asking the speaker to detail the context so that the addressee will understand the non-truth-functional reasons that lead from the antecedent to the consequent.

Sentence (6) is also a prediction. Again, its utterance usually is connected with some contextual reasons which allow a reasoning process to lead from the antecedent to the consequent. It is quite rare for a speaker to express a "pure" guess about anything. We generally have some purpose involved when we utter hypothetical statements. Sentence (6) is most likely to be used in a context something like (11).[8]

(11) John has been in a rotten mood today. We're throwing a party. He wouldn't come to a party unless he's in a good mood. Therefore Perhaps, if John comes, he'll be in a good mood.

Sentence (7) is the easiest of Grice's examples to discuss. A performative analysis of sentences like (7) allows for the suspension of the "indirectness Condition". I doubt very much if Grice actually intended to analyze this sentence entirely truth-functionally. One manner in which an addressee can see that the embedded conditional is true is to prevent him from ever coming but this is certainly not a speaker intention in uttering Sentence (7).[9]

Regardless of whether the "Indirectness Condition" is primary to the semantics of indicative conditional sentences as Strawson claims or whether it is merely a conversational implicature as Grice claims, it will not always disambiguate the experimental frame (3). If both the preceding and following sentences, S_1 and S_3 in (3), can stand in a 'reason' relationship with the if clause, the "Indirectness Condition" predicts that an addressee/reader would find frame (3) ambiguous. As results below will indicate, this is not the case. Readers show a strong preference for certain types of connections, i.e. 'reasons', relating the two clauses of a conditional sentence. It is necessary to examine the types of 'reasons' that allow S_1 to lead to S_2 given $\underline{\text{If } S_1, S_2}$.

One obvious relationship which permits felicitous utterance of conditional sentences is a causative relationship. If the speaker believes that the occurrence of S_1 will cause the occurrence of S_2 then $\underline{\text{If } S_1, S_2}$ is a felicitous utterance.

(12) If you put sugar in water, it will dissolve.
(13) If New York City defaults, many banks will be in trouble.

Another similar relationship that permits the use of conditionals is a pseudo-causal relationship. If a speaker believes that $\underline{S_1 \text{ and then } S_2 \text{ and then } \ldots \text{ and then } S_n \text{ cause } S_{n+1}}$ is true then for every j if $\underline{S_j, S_{n+1}}$ is a felicitous utterance. That is the sentences S_1 to S_n form a causal chain with the result S_{n+1}. Consider, for example, Sentence (14) uttered in the context of an auto race by one fan to another.

(14) If the next driver doesn't see that oil slick, he'll slide into the retaining wall.

A somewhat weaker relationship, but still a frequent one in usage, is a statistical relationship. If a speaker notes that event S_1 always or almost always[10] precedes an occurrence of event S_2 then $\underline{\text{if } S_1, S_2}$ is a felicitous

utterance (cf. Sentence 15). If the speaker strongly expects S_2 to follow S_1 based on inductive or deductive reasoning then If S_1, S_2 is felicitous. Tentatively this relationship is classified with statistical relations (cf. Sentence 16):

(15) If that pitcher tugs on his cap during his windup, he'll throw a curve.
(16) Even if she's found guilty, Patty Hearst might not go to jail for years.

Perhaps rhetorical usage of conditionals should be placed at the bottom of this hierarchy of 'reasons' connecting the clauses of indicative conditional sentences. On hearing a sentence like (17) it seems that we go through something like the hierarchy of reasons trying to find a relationship which fits the two clauses; if the search fails, we examine the context trying to see if a rhetorical usage would be possible; otherwise we reject the sentence as meaningless.

(17) If grass is green, unicorns don't exist.

The division of 'reasons' into three categories is somewhat misleading. The three specific categories chosen actually represent three points on a continuum. Deciding exactly where a relation between two clauses should stand on this hierarchy is often quite difficult.

For the purposes of the following experiment attested sentences have been classified into these relationships using the following intuitive tests: for a causal relationship between clauses S_1 and S_2 the following sentences are f found acceptable S_1 causes S_2 and If S_1 would not occur, S_2 would not occur; for pseudo-causal, one of the tests for causal fails and S_1 together with several other events satisfies the tests for causal, i.e. a causal chain including S_1 can be constructed; for statistical the tests for causal and for pseudo-causal fail.

Within each of these categories there is undoubtedly a continuum of strength and the categories tend to overlap to a certain extent. Consider Sentences (18)

through (22). All of these were classified as statistical relationships though they clearly differ in the strength of the relationship. Sentence (18) was very close to being classified as pseudo-causal and probably would be by other individuals intuitions. Sentence (19) though it is based on statistical evidence just as strong as that on which (18) is based does not overlap with pseudo-causal relations.

(18) If you smoke, you'll get cancer.
(19) If the sunspot ratio goes up, so will women's skirts[11].
(20) If their pitcher tugs on his cap, he'll throw a fast ball.
(21) If that prof smiles when he passes out the exam, it'll be hard.
(22) If I wash my car, it's sure to rain.

To test the hypothesis that the type of relationship as well as the existence of the "Indirectness Condition" has some bearing on speaker acceptance of conditional sentences. The experimental frame described in (3) was used. Nine sentence pairs were selected from a weekly news magazine. The if clause was separated from the sentence with which it was conjoined and given full sentence punctuation. According to my intuitions all possible combinations of the three relationships described above were included in the eighteen sentences and nine if clauses. Various linguists presented with one of the if clauses and one of its relevant sentences could fairly easily accept the resultant conditional sentence. The if clauses thus could plausibly be attached to either the preceding or following sentence forming an acceptable conditional sentence. The combination of my judgements about the relationship together with the acceptability judgements implies that the "Indirectness Condition" holds between the if clause and either of the two sentences. The "Indirectness Condition" alone predicts that readers will not be able to decide whether the if clause modifies the preceding of the following sentence in the test frame.

A questionnaire was constructed presenting the nine pairs of sentences

together with several extraneous frames punctuated as in (3). In all of the pairs of test sentences the time reference followed the time reference of the associated if clause. In preliminary work as noted above intuition had indicated that the opposite time reference would definitely bias the readers' judgments.

Thirty informants, native English speakers, responded to the questionnaire. Fifty questionnaires had been distributed to an introductory generative semantics class. At the time when the questionnaires were distributed the class had been discussing predicates, raising and equi and had not yet begun to discuss logical operators as predicates. The respondents were asked to answer the question "Which sentence, S_1 or S_3, does the if clause modify?" by checking the proper block as in (23).

(23) S_1____, S_3____, either____, neither____.

The predictions based primarily on the hierarchy discussed above but also based on the two potential processing strategies are that first, when the two sentences can potentially stand in the same relationship with the if clause, the majority of informants will indicate that the qualification is ambiguous and a slight majority of those who do select one of the two sentences will select the latter as being qualified by the if clause; second, when the two potential relationships stand at opposite ends of the intuitive scale the informants will overwhelmingly select the sentence which allows a causal relationship regardless of the linear order of the sentences; finally, when the potential relationships are close on the scale, i.e. causal/pseudo-causal or pseudo-causal/statistical, a majority will select the stronger relationship but a fairly large minority will indicate the frame is ambiguous and the processing strategy will interfere so that the weaker relationship will often be selected if it allows the if clause to modify a following antecedent.

The table in (24) presents the experimental results[12]. Totals will not add to 31 because a few informants had fairly restrictive intuitions deciding in various experimental frames that neither sentence could be qualified by the *if* clause. A possible error on the experimenter's part was not including a frame in which the *if* clause obviously could not modify either sentence. This non-inclusion together with the possible judgment that neither sentence is modified by the *if* clause (cf. (23)) may have biased several informants to judge the frames very restrictively.

(24)

pot. rel. w/ *if* clause \ 2nd Sent., S_3 / 1st Sent., S_1	potential relationship with *if* clause: CAUSAL			PSEUDO-CAUSAL			STATISTICAL		
	S_1	S_3	&	S_1	S_3	&	S_1	S_3	&
CAUSAL	4	11	12	5	2	24	28	0	2
PSEUDO-CAUSAL	3	11	11	0	20	11	27	0	1
STATISTICAL	0	30	1	3	27	1	3	8	19

First, we can note that a strategy of selecting S_3 based on the preponderance of sentence-initial *if* clauses did not greatly bias the judgments:

(25)

	S_1	S_3	&
total	73	109	82

The experimental results essentially bear out the predictions made above. In equal value potential relationships, causal/causal, pseudo-causal/pseudo-causal, and statistical/statistical, the informants' choices occurred with the following frequencies:

(26)

	S_1	S_3	&
total	7	39	42

A slight majority indicated ambiguity as predicted and of those respondents who

selected a particular sentence in the frame the majority selected the latter sentence, S_3, as predicted by a processing strategy based on the preponderance of sentence-initial *if* clauses. In the frames with the potential relationships at opposite ends of the hierarchy, statistical/causal and causal/statistical the respondents judgments yielded an overwhelming selection of the causal potential relationship as predicted:

(27)

	causal	stat.	&
total	58	0	3

The two close relationships cases do not follow the predicted trends. The pseudo-causal relationship was strongly favored over the statistical regardless of the order of the sentences:

(28)

	ps-causal	stat	&
total	54	3	2

The specific sentences selected for the questionnaire were on the order of Sentence (16) rather than Sentence (15). It is possible that the true statistical relationships, i.e. *if* clauses whose relationship to their antecedent is arrived at strictly through inductive reasoning should have been separated from relationships which are derived through a combination of inductive and deductive reasoning (cf. Sentence (16)) and relationships derived strictly through deductive reasoning. The category, statistical relationship, should be subdivided into the categories: inductive relationship, inductive plus deductive relationship, finally deductive relationship. The latter category would probably merge with the usage termed rhetorical above.

The causal/pseudo-causal frames also did not follow the predicted trends:

(27)

	causal	ps-causal	&
total	16	5	35

More respondents than expected indicated that this situation was ambiguous than expected. Examining the experimental results we see that the frame with causal sentence occuring first was responsible for the departure from prediction. Frame (28) presents the situation:

(28) Last week a federal study indicated that about 100 of the nation's 15,048 banks had invested sums equal to 50% or more of their capital in New York City bonds and thus would be in serious trouble. If a default caused the value of those securities to plunge. The banks would probably not be wiped out.

The alternate order frame did not produce anomalous results and it may be the case that a processing strategy based on the resulting "heaviness" of the first sentence with the if clause appended together with a processing strategy based on the preponderance of sentence-initial if clauses biased the results in this test frame.

The results, however, definitely show that some principle other than or in addition to the "Indirectness Condition" is functioning. All of the frames should be judged as ambiguous by the informants based on the predictions of the "Indirectness Condition". To handle this situation within Grice's approach, we would have to invent a metric on quality; a metric derived from the hierarchy of potential relationships. Of course, such a metric is not really contrary to Grice's hypotheses about language. To handle the situation within Strawson's approach, we would have to subcategorize the "reasons" via which the antecedent clause leads to the consequent clause. Again this approach is not really contrary to Strawson's hypotheses about language.

In the process of devising this test, it was noted that certain strategies do outweigh the importance of the hierarchy in disambiguating the experimental frame. As noted above the time relationship can strongly bias judgments. Also as might be expected deixis relationships can strongly influence judgments. In

two of the dummy sentences in the survey a statistical-causal relationship yielded the following results:

(29)	causal	stat.	&
total	10	41	11

It is claimed that this reversal of results was caused by the reference relationship. The sentences producing the causal potential relationship would have a case of backwards pronominalization with the if clause appended; the statistical sentences a case of forwards pronominalization. The occurrence of the latter strongly outweighs the occurrence of the former in English:

(30) Saudia Arabia, which produces about a fourth of all OPEC oil, has the power to break the cartel. If it chooses. No price increase that Saudia Arabia finds intolerable has a chance of sticking.

Several strategies interact in processing potentially ambiguous data like the above. Reference, temporal order, the preponderance of sentence-initial if clauses and the hierarchy of potential relationships all influence the processing of clauses occurring in frame (3). As initially claimed semantic and pragmatic information and hypotheses based on such information must be available to a processing grammar if it is to correctly disambiguate the chosen frame.

If clauses are processed as units as Bever and others claim, this pragmatic and semantic information can apply at the point at which the three clauses are processed. A partial semantic analysis of each clause must be completed p prior to deciding the reference of the if clause.

The hierarchy of values described above for disambiguating the experimental frame would not be very interesting if it only applied to situations in which phonetic/phonological or punctuational data was missing or unobtainable. A problem for any traditional logical analysis of natural language is the lack of parentheses in natural language. Logical systems can easily generate the type of sentences illustrated in (31) but they are incapable of parsing such

sentences. The hierarchy developed above affords a potential strategy for parsing multiple operator sentences:

(31) 'If S_1, S_2 and S_3' 'If S_1, S_2 or S_3'
'S_1 and S_2, if S_3' 'S_1 or S_2, if S_3'

In a processing grammar the hierarchy of possible relationships could again be applied after a clausal processing to disambiguate the sentences in (31). Language users are quite capable of distinguishing whether an if clause modifies a single sentence or a conjunction of sentences in frames like (31). Consider the following sentence. Sentence (32) could either be analysed as a conjunction of a simple sentence and a conditional sentence or as a conditional sentence with a compound consequent. The hierarchy predicts that most readers would identify this frame as a conjunction of a simple sentence and a conditional sentence. The particular example is not very strong since it was chosen to allow for ambiguity; however consider Sentence (33) for a more striking example:

(32) We never came back in groups and we spent hours losing a tail, if we had the slightest idea we were being followed.

(33) Many people will be shocked and RFK's memory will be tarnished, if the Warren Commision Report is found to be false.

Sentence (33) is clearly a conditional sentence with a compound consequent clause.

Within a strictly generative model, this hierarchy can be used as a blocking rule in contexts that do not permit a rhetorical conditional interpretively on sentences conjoined with if or it can be a (transderivational?) constraint on predicting the acceptability of a logical structures resulting in two clauses conjoined by if. The final form of the hierarchy is presented in (34):

(34) causal > pseudo-causal > inductively based > inductively and deductively based > deductively based

Appendix

The questionnaire sentences together with the intuitive classification into the "reason" hierarchy are presented below:

1 causal/causal

Taxpayers elsewhere are not going to be penalized. If a federal guarantee is available. Other cities will be vaccinated against the virus that has weakened us.

2 causal/pseudo-causal

Last week a federal study indicated that about 100 of the nation's 15,048 banks had invested sums equal to 50% or more of their capital in New York City bonds and thus would be in serious trouble. If a default caused the value of those securities to plunge. the banks would probably not be wiped out.

3 causal/statistical

Grant's future survival will depend on how profitably it manages to sell off its inventory. Even if it can squeak past the threat of a bankruptcy liquidation next year. The chain will still be carrying a mountainous backlog of big appliances.

4 pseudo-causal/causal

We never left or came back in groups. If we had the slightest idea we were being followed. We spent hours losing a tail by riding buses endlessly or dodging through big stores.

5 pseudo-causal/pseudo-causal

The women were frequently sent out to steal. If we were near a university. The women stole purses from the women's dorms.

6 pseudo-causal/statistical

The virgin will have screamed and have been rescued in time. If she had not wanted sex. An Assyrian whose virgin daughter was violated could gain justice by raping the attacker's wife.

7 statistical/causal

We'd get up and start with physical exercise -- push-ups, sit-ups that sort of thing. If there was anything to eat. We'd have a quick meal.

8 statistical/pseudo-causal

They stole purses from the women's dorms. If they had an I.D. and a checkbook in them. They went out as fast as possible to kite the checks.

9 statistical/statistical

Once free on bond, Patty Hearst might not go to jail for years. Even if she was found guilty. The verdicts would undoubtedly be appealed for as long as possible.

Footnotes

[1]For example, the work being done at the Stanford Research Institute and at Bolt, Beranek, Newman.

[2]Although the specific form of the syntactic processor is not discussed, Wood's model (W. Woods 1970) has formed the basis for my thoughts on processing grammars.

[3]Actually the layout and type selection completely disambiguated this frame.

[4]Time, The Weekly Newsmagazine. Note: only indicative conditional sentences with an explicit if clause and with theillocutionary force of statements have been considered. Hedges like (i) and suspenders like (ii) have not been considered in arriving at the figures above:
(i) If I'm not mistaken, Ford will not support New York City.
(ii) New York will have to be rescued by December, if at all.

[5]See for example B. Nash-Webber and M. Bates 1973

[6]In a footnote to lecture Grice develops a general frame for the cancellability of the "Indirectness Condition":

i) If you put that bit of sugar in water, it will dissolve;though so far as I know,there could be no way of knowing in advance that this is what will happen.

The difficulty, here, is in accepting that the speaker "knows" that the occurrence of the antecedent will lead via non-truth-functional reasons of "knowing" that the consequent will occur. We never know the future. The "Indirectness Condition" must refer to speaker beliefs not to certain knowledge. Note the oddity of Grice's suspension with believe replacing know:
ii)?If you put that bit of sugar in water, it will dissolve; though so far as I believe, there could be no way of believing in advance that this is what will occur.

[7]Cf. R. Lakoff 1970 and R. Binnik 1971 and 1972 for similar results.

[8]The context developed in (11) is actually much stronger than necessary to derive the non-truth-functional reason but it so appears for illustrative purposes.

[9]In my thesis I will discuss sentences like (7) to argue for a Stalnaker-Thomason type of conditional logic.

[10]Once again generic quantification rears its ugly head (cf. Lwaler 1973 and Tedeschi 1973).

[11]Example due to J. Lawler.

[12]In this and all following tables, the column headed S_1 reports the frequency of respondents selecting the preceding sentence as being qualified by the if clause, S_2 the frequency selecting the following sentence, & the frequency deciding that the if clause could qualify either sentence.

References

Bever, T. 1970 "The Comprehension and Memory of Sentences with Temporal Relations" in E. D'Arcais and W. Levelt, eds., Advances in Psycholinguistics, North Holland Publ. Co.

Binnik, R. I. 1971 "Will and Be Going To", CLS 7, pp. 40 - 51.

_____ 1972 "Will and Be Going To II", CLS 8, pp. 3 - 14.

Grice, H. P. 1972 "Conversational Implicature", unpublished ms., Harvard Lecture Series.

Keller-Cohen, D. 1974 "Cognition and the Acquisition of Temporal Reference", CLS 10, pp. 310-320.

Lakoff, G. and H. Thompson 1975a "Introducing Cognitive Grammar", Berkeley Linguistic Society, V. 1, pp. 295-313.

_____ 1975b "Dative Questions in Cognitive Grammar", CLS 11, pp. 337-350.

Lakoff, R. 1970 "Tense and its Relation to Participants", Language, V. 46, Dec. 1970, pp. 838-849.

Lawler, J. 1973 "Studies in English Generics", UMPIL,v 1, 1.

Nash-Webber, B. and M. Bates 1973 "Syntactic and Semantic Support for a Speech Understanding System", presented at the Eleventh Annual Meeting, the Association for Computational Linguistics.

Strawson, P. F. 1956 "Propositions, Concepts, and Logical Truth", Philosophical Review, 56.

Tedeschi, P. 1973 "Some Suggestions for a Semantic Analysis of Progressives", UMPIL, V. 1, 2, pp. 157-168.

Winograd, T. 1972 Understanding Natural Language, Academic Press.

Woods, W. A. 1970 "Transitional Network Grammar for Natural Language Analysis", Communications of the ACM, 13, 10.